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AUTHOR Sakamoto, Takashi; Nakanome, Naoaki
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ABSTRACT

This assessment of the status of computer assisted school automation (CASA) in Japan begins by describing the structure of the Japanese educational system and the roles of CASA in that system. Statistics on various aspects of computers in Japanese schools and the findings of several surveys are cited to report on the present state of educational computing, educational computing in the curriculum, computer assisted automation (CASA) in the schools, and educational information networks. Areas that can be supported by CASA in teaching, instructional management, and school administration are then listed: (1) curriculum development, lesson planning, time scheduling; (2) instructional design and evaluation; (3) information retrieval of educational materials and devices and production of educational materials; (4) diagnosis and evaluation of teaching processes concerning information on individual children; (5) data processing on achievement scores; (6) information on school counselling; (7) information on school and vocational guidance; (8) health and physical ability records; (9) information about the library; and (10) data processing on other school affairs. The status of these applications is briefly reviewed, and developmental strategies for CASA are described. Future tasks in the areas of teaching personnel and the infrastructure for supporting CASA are briefly discussed, and a need for financial support by both the central and local governments is indicated. (BBM)

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COMPUTER ASSISTED SCHOOL AUTOMATION (CASA) IN JAPAN

Takashi SAKAMOTO* & Naoaki NAKANOME**

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COMPUTER ASSISTED SCHOOL AUTOMATION (CASA) IN JAPAN

Takashi SAKAMOTO* & Naoaki NAKANOME**

*Tokyo Institute of Technology, Yokohama-shi, Kanagawa 227, Japan
**Nagaoka University of Technology and Science,
Nagaoka-shi Niigata 940-21, Japan

1. Structure of the Japanese Educational System

The main characteristics of Japanese Educational System are school education oriented and centralized.

(1) The Japanese school system has 6 year primary schools, 3 year middle schools, 3 year high schools and 2 year colleges or 4 year universities. In high school level, there are vocational high schools and 5 year professional high schools.

(2) Equity for educational opportunity is well maintained over the country. The Ministry of Education, Science and Culture has responsibility for the central educational administration and the Local Boards of Education are responsible for local administration. These provide the infrastructure for school education and advise school teachers on educational activities.

(3) According to the Course of Study which is the national standard, common educational objectives and contents are established nation wide. The level of achievement in children is kept high in fundamental and basic knowledge and skills, as the IEA survey shows.

(4) The qualification of teachers is also getting better. Most of them are university graduates and the number of those having master's degree is increasing, especially among high school teachers.

Generally speaking, the Japanese school system is now successful especially at the primary and secondary school level. However there are some problems such as the high competitive entrance examinations, juvenile delinquency, underground coaching schools, reduction of educational activities in the community and families, shortage of computers, and so on.

2. Roles of CASA in Japanese Educational System

The introduction of computers into Japanese schools is behind from other developed countries [1] [4] . Some teachers would consider computers as teaching tools and feel no need for their support for already successful teaching. In this situation, CASA (Computer Assisted School Automa-

tion) would be welcome for supporting educational administration rather than teaching, and would give impacts on the use of computers in the broader areas of education [5].

CASA has also direct effects on individually based education, because CASA would provide teachers with (1) information about educational objectives, contents, materials, study tasks, etc. (2) information about children's characteristics, interests, abilities, health condition, preferences, motivation, study skills and (3) information about facilities and devices available for use in schools.

Moreover, school teachers can also get suitable information from outside resources through communication networks. Schools in Japan have been usually isolated from their local communities and society, but schools would be oriented as a part of society by CASA, (which is called school automation after office automation) and also by the communication networks.

CASA would have many benefits on Japanese school education.

3. Computer Use in Education

(1) The Present State of Educational Computing

In March 1990, the distribution ratio of computers was 30.9 % in primary 58.9 % in middle, 97.8 % in high schools, and 71.0 % in special schools and the average number of units of computers in each school were respectively 3.1, 5.5, 29.8 and 4.1. The number of teachers who can operate computers is also 10.1 %, 18.3 %, 32.3 %, and 12.4 %. At the moment, few teachers are using computers as tools for school administration and for teaching.

However the Ministry of Education, Science and Culture has provided 12.3 billion yen in total for 5 years for school purchase of computers. As the amount is 1/3～1/2 matching funds, approximately 30 billion yen should be provided from the local funds. In 1990, the budgets increased to 5 billion yen/year from the Ministry of Education, Science and Culture and 10 billion yen/year from the Ministry of Local Affaires to local governments as the Local Allocation Tax Grant. Also the Ministry of Local Affairs provided a budget of 8.6 billion yen/year for school purchase of educational software. Therefore all schools will have computers in a few years.

(2) Educational Computing in Curriculum

Since 1985, many National Councils, Commissions and Task Forces concerning educational computing have been established and published reports. Their contents ranged from the central policies, philosophy, and educational objectives to budgetary items on educational software, facilities and devices, and teacher training. In 1989, the new course of study which emphasized the educational computing in schools was announced and will be taught after 1992. Fundamentals of informatics was included as one of subject areas in technology and home economics in middle schools. Computers were also recommended for use in science, mathematics and all subjects.

(3) CASA

Several teachers in most of schools having computers are now using computers as CASA, as well as CAI and CAL [3].

According to the National survey conducted by the JAPET (Japan Association for the Promotion of Educational Technology) in 1985, approximately 5,800 out of the 39,628 who replied to the questionnaire among all 42,093 Japanese schools from primary to high including special schools

answered that they had computers. More than 90 % (about 5,400 out of 5,800) used computers for CASA and 57 % used computers for teaching. The largest use of computers in CASA was data processing on achievement scores in primary schools, 43.1 % of which used. Then data processing on other school affairs (33.8 %), health records (24.8 %), diagnosis and evaluation in classroom study (22.0 %), information retrieval of educational materials (21.3 %) followed. Regarding the middle schools, the largest use was also data processing of achievement scores (99.1 %), and data processing of other school affairs (29.9 %), information of school guidance (24.2 %), health data records (16.2 %) followed. In the high schools, the largest use was the same as in the middle schools. (88 %) and as was the second (30 %) and the third (28.9 %). Then information retrieval of educational materials (25.9 %) followed [4].

The survey on computer use in those schools having computers by the CEC (Centre for Educational Computing) in 1987 showed that 82 % of the 1,474 schools who replied to the questionnaires used computers for CASA. As shown in Figure 1, the ratios of schools using computers only for CASA were 30.5 %, 37.4 %, 24.1 % respectively in primary, middle and high schools. These figures were larger than those using computers only for teaching which are 13.2 %, 3 %, and 8.9 %, although the ratios of schools using computers both for CASA and teaching were the largest at all school levels.

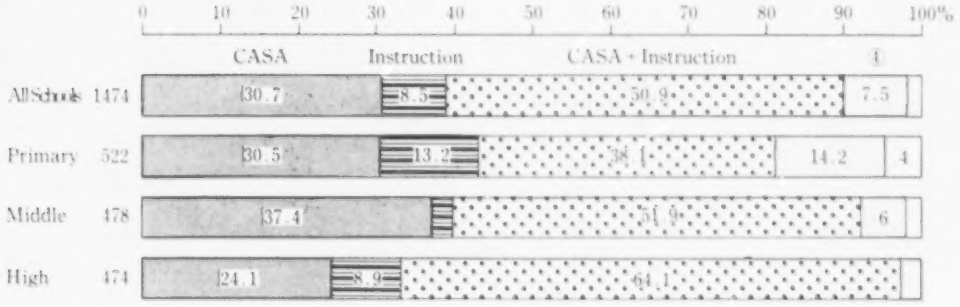

Figure 1. Computer Use in Schools.

As far as jobs in CASA were concerned, the data processing for achievement scores were the most common and various kinds of school affairs were next, as shown in Figure 2. In high schools, many used them for data processing of the entrance examination. Future planning for CASA will be included uses for curriculum development, instructional planning, and time scheduling and uses for physical and health diagnosis.

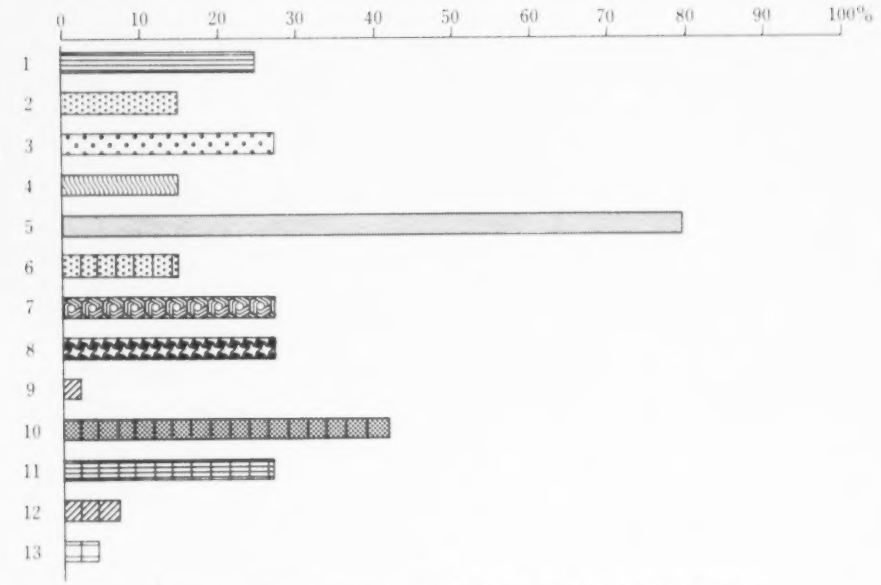

Figure 2. Present State of Use of Software for School Administration and Management

1. Curriculum Development
2. Lesson Plan, Evaluation
3. Retrieval for Materials & Devices, Authoring
4. Diagnosis and Evaluation in Teaching Processes
5. Data Processing for Achievement Scores
6. Data Processing for Guidance
7. Information for Guidance
8. Physical Measurment, Health Diagnosis
9. Library
10. Miscellaneous School Affaires
11. Entrance Examination
12. Others
13. No reply

According to the Japanese survey on school teachers using computers conducted by COMPED (Computers-in-Education Study) in IEA (International Association for the Evaluation of Education Achievement) in 1990, the largest area of computer use in school administration and management is wordprocessing. 67.7 % of 223 primary schools having computers, 78.3 % of 286 middle schools and 82.3 % of 322 general high schools are using computers as tools for wordprocessing. The second largest use is data processing of children's achievement scores. Respectively 15.2 %, 47.9 % and 51.2 % of schools are using them in this way. The third one is accounting. 19.3, 22.0 and 39.1 % are those ratios (Table 1).

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Table 1. Computer Use for School Administration and management

	Primary (N=223)	Middle (N=286)	High General (N=322)	High Vocational (N=329)
Administration on Teacher's Working	5.4%	4.9%	4.1%	4.8%
Administration of Student Achievement Score	15.2	47.9	51.2	32.8
Time Scheduling	2.2	8.3	8.4	7.6
Accounting	19.3	22.0	39.1	41.0
Library Administration	4.0	3.8	11.8	8.2
Text Processing	67.7	78.3	82.3	80.6

According to the survey on computer use in schools having computers by the JAPET in 1990, the results of 1,424 schools from primary to high schools showed that word-processors were also most utilized in schools and spreadsheets, graphics and data base softwares follow.

Concerning the use of word processing the percentages of schools where teachers used computers very often for wordprocessing were 77 % in vocational high schools, and 60 % in schools for deaf children and 50 % in middle school and general high school teachers, and 28 % in primary schools. Considering schools where teachers used them fairly often, the figures increased respectively 87, 77, about 70 and 40 %, as shown in Figure 3).

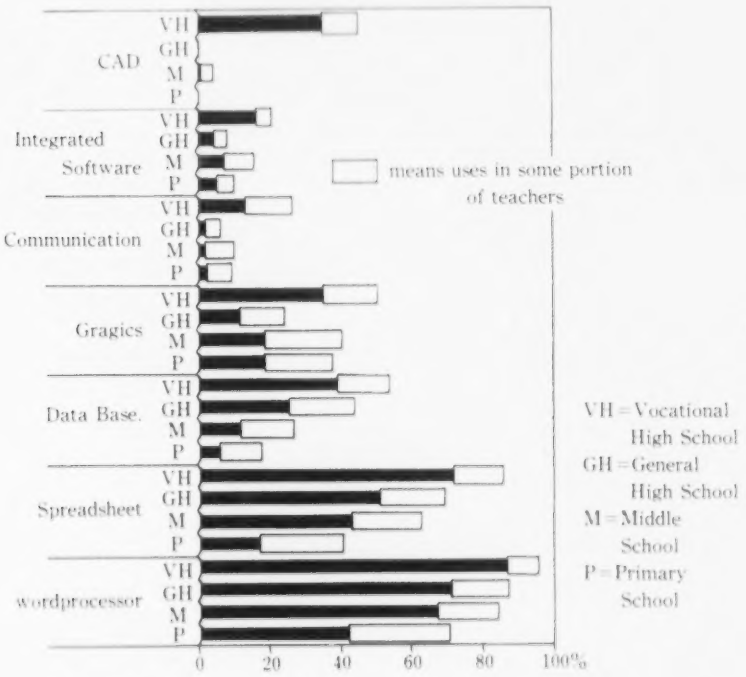

Figure 3. Use of Application Softwares for CASA by teachers

As far as spreadsheets are concerned, the percentages of schools were 50 % in vocational high schools, 34 % in general high schools and 27 % in middle schools.

The survey also showed that softwares for data processing of achievement scores were well utilized in schools and authoring tools for designing courseware follow (Figure 4). These softwares are sometimes utilized by students in the classroom.

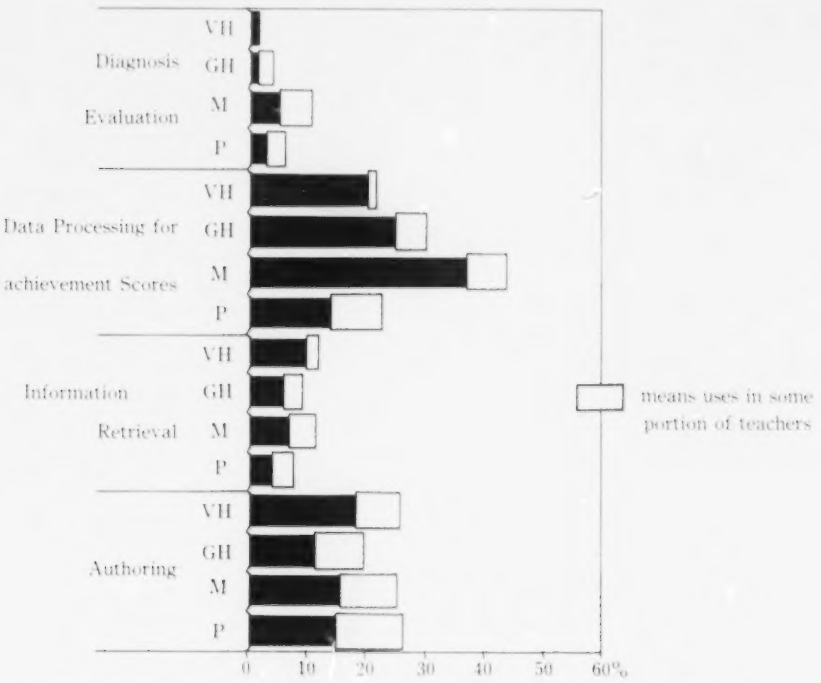

Figure 4. Frequency of Use of Software for Instructional Development by Teachers.

(4) Educational Information Network

Excluding academic reference services, no systematic nation wide educational information network has been established, though a national plan has been presented by the Social Education Council and the Task Force on Educational Information Communication in the Ministry of Post and Telecommunications [2] [4].

Only a few local boards of education have established the local educational information networks. For example, Asahi city, Chiba prefecture near Tokyo, has established a city educational resource centre and relays recent information on the local social facts to local schools. Teachers can retrieve and show these data to children through computer communication in the school classroom. Amagasaki city, near Kobe also transmits problems on primary arithmetic to schools through computer communication by the teacher's requests. In Gifu prefecture, the University of Gifu has a sophisticated data base on educational information such as educational objectives, contents, prob-

lems, children's answer ratio to problems, educational materials. Primary and Middle schools nearby retrieve those data by computers.

In some other districts, educational information networks have been established and utilized. In Kurashiki City in Okayama and Kanoya City in Kagoshima, all schools paticipate in information networks and can retrieve information about educational materials and devices and other educational information from the Center. In Akita, Ishikawa and Aichi prefectures, and Osaka City, some shools have infomation networks and can retrieve similar educational information. Moreover in Aomori, Wakayama and Kumamoto prefectures, local boards of education have networks and transmit information about fundamental data on school education.

Some schools have classroom LANs, but do not always use them effectively. In the survey by the CEC in 1987, 165 schools used LAN systems which were mostly utilized for down loading of the courseware from the central units to terminal units, and for collecting the study histories of students. However, the percentage of schools expressing dissatisfaction with LAN was 51 %, larger than the 46 % expressing satisfaction (Figure 5).

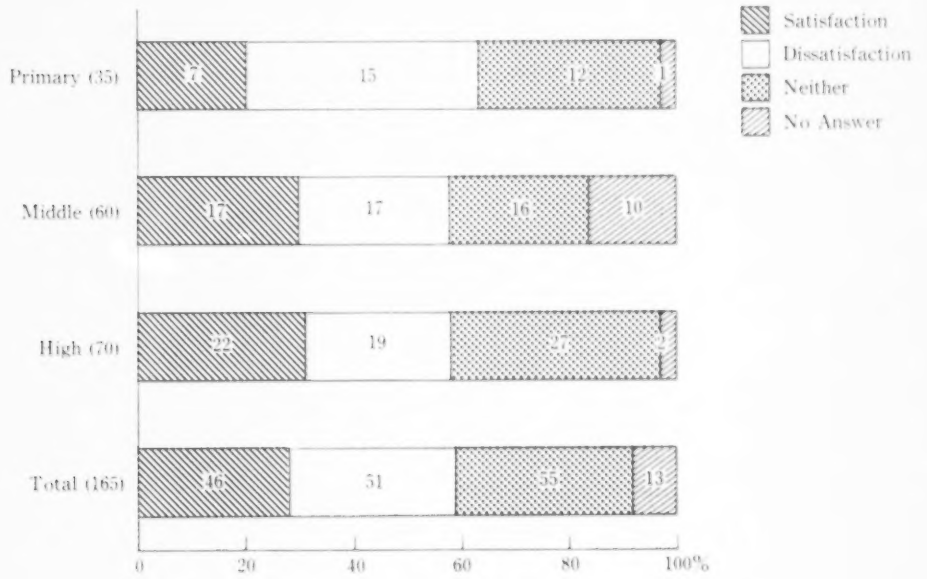

Figure 5. Perception of Teachers on LAN

3. Examples of CASA

Areas which can be supported by CASA are as follows;
concerning teaching.

1. curriculum development, lesson planning, time scheduling
2. instructional design and evaluation
3. information retrieval of educational materials and devices and production of educational materials

4. diagnosis and evaluation of teaching processes concerning individual children's information. Concerning administration
5. data processing on achievement scores
6. information on school counselling
7. information on school and vocational guidance
8. health and physical ability record concerning school management
9. information about the library
10. data processing on other school affairs.

As far as a support for teaching is concerned, some schools are using computers for time scheduling (25 % in the CEC survey in 1987) and this gives effective results. Some teachers use computers for designing lesson plans (15 %) by using special methods such as computer assisted lesson desigh and for retrieving educational information from the data base (30 %). A few teachers (15 %) are also analyzing their own classroom teaching by computers and investigate the state of interactive communication between teachers and children and among children. Teachers can use these data for improving their teaching. Some teachers (30 %) are using computers for developing educational materials, supported by graphic tools, word-processors and image scanners. Frequently they use authoring tools for developing courseware.

Regarding children's individual data, many teachers (50 %) calculate means and standard scores of achievement in each subject, and general trends in class, grade and schools. Some schools input information about characteristics, achievement scores, physical abilities, interests, hobbies, friends, future direction, club activities, attendance, lateness, home address, family activities for each child. In these cases, privacy and security are carefully considered.

Some middle and high schools use the information processing system for entrance examination and vocational guidance (30 %). A lot of data on colleges, universities and industries are stored in a data base and utilized in a guidance system such as the HEART system in the Centre for the University Entrance Examination. Some schools (50 %) record children's health condition by computer, e. g. y height, visual acuity, teeth condition, physical abilities, and utilize these statistics for health administration and allocation of desks and chairs.

Concerning school administration, a sociometric test by computer is implemented in some schools. A middle school inputs data on annual school events, retrieves the procedure and necessary information, and prepares events efficiently and thoroughly. Sometimes teacher's individual records are input and utilized for movement and promotion. Such the data are for example, gender, age, duration of work in the same school, total duration of teaching experience as club adviser, university, specialism, home address, marital status, special skills and interests, academic career, intention of movement, future expectation, etc.

A variety of usage of CASA is found in advanced schools, but most of them are not so popular to be undertaken in every school yet.

In CASA many commercial softwares are utilized in schools. According to the above mentioned survey by the JAPET in 1990, schools utilized 36 different kinds of Japanese word processors, 13 sorts of spreadsheets, 21 kinds of data base, 19 sorts of graphics, 12 kinds of communication, 16 different kinds of integrated software, and 12 sorts of CAD and also 64 different kinds of authoring tools, 6 kinds of data base software, 27 kinds of data processing, 22 kinds of evaluation and diagnosis software, and other kinds of software such as on line CAI.

5. Developmental Strategies on CASA

CASA in Japan has just begun practical implementation. However CASA is now more advanced in use than CAI is. The practical areas of CASA are expanding gradually to cover all sorts of school administration. In order to promote CASA, long and short term planning concerning allocation and effective use of computers in local schools are required. Local Educational Information Systems should be established within schools and between schools. In all schools Divisions of Educational Computing or Information Centre should be set up and in the local community networks among schools and other educational institutions are required. If only a few pilot schools establish school LAN and information systems, the impact is not so large. Information exchange and networks among other local schools and educational institutions further the use of CASA in the local community. At the moment, there is some shortage of hardware, software and able teachers.

Educational information systems are not well established nationwide nor locally yet. The plans concerning national and local educational information centres are already presented in many places, and some are implemented on an experimental basis. Such cases will be gradually expanding nationwide.

At the moment, CASA improves some aspects of school administration, such as the efficiency of data processing, presentation of well prepared materials for meetings and facilitates planning. However there are still big problems such as the only partial use of computers by just a few teachers, shortage of software, shortage of computers themselves and shortage of computer rooms.

6. Future Tasks

In order to improve school education by CASA, many problems should be solved.

(1) Teaching Personnels

Concerning teaching personnels, the revolution of teachers' perception of CASA is most important. Teachers are usually conservative and do not always see the necessity of introducing computers into school education and school administration. At the moment, teachers who can operate computers are not in the majority. More teachers should study educational computing on inservice teacher training courses and in on the job training. The percentages of teachers who had some training in the use of computers were 10.1 in primary, 18.3 in middle, 32.3 in high and 12.4 in special schools among all school teachers in 1990 survey by the Ministry of Education, Science and Culture.

The role of the head teachers is espeially important for promoting CASA. They should sometimes work actively in front of teachers. There are still big differences in the attitudes towards computers between head teachers.

Therefore many occasions for teacher training should be provided by the local basis of education, professional associations and industries. In these cases their systematic integration would be useful. On the job training within schools is also very desirable. A common perception of CASA and a cooperative attitude would be cultivated by interaction among teachers.

(2) Infrastructure

Concerning this infrastructure for supporting CASA, good software, hardware, facilities, and a well organized information network, are required. Recently good commercial application software has become available. These are for wordprocessing, graphics, data bases, spreadsheets, authoring, communication and their integrated software.

But delivery systems have not been well organized yet. Teachers have some difficulty to get to know them and to obtain them. Therefore collaboration among schools, local administration, universities, educational institutions and industries would produce good quality of software and provide efficient systems of software delivery.

The serious problem is the school facilities. Traditional classrooms are very small and unable to accommodate educational devices like OHPs and computers. Schools should reform traditional classrooms or build computer laboratories or open plan rooms. Now the Ministry of Education, Science and Culture is establishing the standard of facilities for educational computing [2].

Educational information systems are not established yet and even the number of telephone lines in schools is also incredibly small. CASA in schools should be supported by the upgrading of such communication networks. A national information network system integrating local information network systems and school LAN should be established.

(3) Governmental Supports

As CASA needs more money for implementation, the administrative divisions in government should fully understand the efficiency of CASA and support the introduction of CASA. Both central and local government should provide more budget for introducing CASA into schools, although the budget is now increasing annually.

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Most of references are written in Japanese and not included in this paper. Details are described in the paper [3] in Japanese.

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